

1 1. A method of relating a plurality of images of a tissue, said method comprising:
2 obtaining a plurality of images of a tissue;
3 determining a relationship between two or more regions in each of two or more of
4 said images;
5 segmenting at least a subset of said two or more images based at least in part on
6 said relationship; and
7 relating two or more images of said subset of images based at least in part on said
8 segmenting.

1 2. The method of claim 1, wherein said determining of said relationship comprises
2 determining a measure of similarity between at least two of said two or more regions in
3 each of said two or more of said images.

1 3. The method of claim 2, wherein said determining of said measure of similarity
2 comprises computing an N-dimensional dot product of mean signal intensities of two of
3 said two or more regions.

1 4. The method of claim 1, wherein said tissue comprises cervical tissue.

1 5. The method of claim 1, wherein said plurality of images comprises sequential
2 images of said tissue.

1 6. The method of claim 1, further comprising filtering said subset of said two or
2 more images.

1 7. The method of claim 6, wherein said filtering comprises applying at least one of a
2 temporal filter and a spatial filter.

1 8. The method of claim 1, further comprising applying a chemical agent to said
2 tissue.

1 9. The method of claim 8, wherein said chemical agent is selected from the group
2 consisting of acetic acid, formic acid, propionic acid, butyric acid, Lugol's iodine,
3 Shiller's iodine, methylene blue, toluidine blue, and indigo carmine.

1 10. The method of claim 1, wherein said obtaining step comprises collecting an
2 optical signal.

1 11. The method of claim 10, wherein said optical signal comprises fluorescence
2 illumination.

1 12. The method of claim 10, wherein said optical signal comprises reflectance
2 illumination.

1 13. The method of claim 1, wherein said obtaining of said plurality of images
2 comprises recording visual images of said tissue.

1 14. The method of claim 1, wherein said relating step comprises determining a
2 segmentation mask of an image plane wherein two or more regions of said image plane
3 are differentiated.

1 15. The method of claim 1, wherein said relating step comprises defining one or more
2 data series representing a characteristic of one or more associated segmented regions of
3 an image plane.

1 16. A method of relating a plurality of images of a tissue, said method comprising:
2 obtaining a plurality of images of a tissue;
3 determining a measure of similarity between two or more regions in each of two
4 or more of said images; and
5 relating at least a subset of said two or more images based at least in part on said
6 measure of similarity.

- 1 17. The method of claim 16, wherein determining said measure of similarity
2 comprises computing an N-dimensional dot product of mean signal intensities of two of
3 said two or more regions.
- 1 18. A method of determining a tissue characteristic, said method comprising:
2 obtaining a plurality of images of a tissue;
3 determining a relationship between two or more regions in each of two or more of
4 said images;
5 segmenting at least a subset of said two or more images based at least in part on
6 said relationship; and
7 determining a characteristic of said tissue based at least in part on said
8 segmenting.
- 1 19. The method of claim 18, further comprising applying a chemical agent to said
2 tissue.
- 1 20. The method of claim 19, wherein said chemical agent is selected from the group
2 consisting of acetic acid, formic acid, propionic acid, butyric acid, Lugol's iodine,
3 Shiller's iodine, methylene blue, toluidine blue, and indigo carmine.
- 1 21. The method of claim 18, further comprising filtering said two or more images.
- 1 22. The method of claim 21, wherein said filtering comprises applying at least one of
2 a temporal filter and a spatial filter.
- 1 23. The method of claim 18, further comprising processing said two or more images
2 to compensate for a relative motion between said tissue and a detection device.
- 1 24. The method of claim 18, wherein said tissue comprises cervical tissue.

1 25. The method of claim 18, wherein said segmenting comprises analyzing an aceto-
2 whitening signal.

1 26. The method of claim 18, wherein said plurality of images comprises sequential
2 images of said tissue.

1 27. The method of claim 18, wherein said segmenting comprises analyzing a variance
2 signal.

1 28. The method of claim 18, wherein said segmenting comprises determining a
2 gradient image.

1 29. The method of claim 18, further comprising processing one or more optical
2 signals based at least in part on said segmenting.

1 30. The method of claim 18, further comprising filtering at least one image based at
2 least in part on said segmenting.

1 31. The method of claim 18, wherein said determining a characteristic of said tissue
2 comprises determining one or more regions of said tissue with a suspicion of pathology.

1 32. The method of claim 18, wherein said determining a characteristic of said tissue
2 comprises classifying a region of tissue as one of the group consisting of normal
3 squamous tissue, metaplasia, CIN I, and CIN II/CIN III.

1 33. A method of determining a characteristic of a tissue comprising the steps of:

2 (a) for each of a first plurality of reference sequences of images of tissue
3 having a first known characteristic, quantifying one or more features of each of a
4 plurality of mean signal intensity data series corresponding to segmented regions
5 represented in said each of said first plurality of reference sequences of images;

6 (b) for a test sequence of images, quantifying one or more features of each of
7 one or more mean signal intensity data series corresponding to one or more segmented
8 regions represented in said test sequence of images; and
9 (c) determining a characteristic of a tissue represented in said test sequence of
10 images based at least in part on a comparison between said one or more features
11 quantified in step (a) and said one or more features quantified in step (b).

1 34. The method of claim 33, wherein step (c) further comprises repeating step (a) for
2 each of a second plurality of reference sequences of images of tissue having a second
3 known characteristic.

1 35. The method of claim 34, wherein step (c) further comprises applying a
2 classification rule based at least in part on said first plurality of reference sequences and
3 said second plurality of reference sequences.

1 36. The method of claim 35, wherein step (c) comprises performing a linear
2 discriminant analysis to determine said classification rule.

1 37. The method of claim 33, wherein one of said one or more features quantified in
2 step (a) comprises the slope of a curve at a given point fitted to one of said plurality of
3 mean signal intensity data series.

1 38. The method of claim 33, further comprising determining said segmented regions
2 of said test sequence of images by analyzing an acetowhitening signal.

1 39. The method of claim 34, wherein said first known characteristic is CIN II/CIN III
2 and said second known characteristic is absence of CIN II/CIN III.

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